Terror-Related Wastewater Pollution in the North-African Region[1]

Gábor Szűcs[2], Zsolt Szabó[3]

Abstract:

The initial focus of our research was a recently published article that examined the potential for wastewater treatment systems to be vulnerable to terrorist attacks. The findings of the present study have prompted the continuation of research on a regional basis, with the aim of analysing the threats to water reuse in North Africa. In the present analysis, the objective was to summarise the results by means of database processing and by searching for relevant sources in English and Arabic. While wastewater treatment facilities do not constitute the primary objectives of terrorist organisations, research on attacks and databases indicate that these facilities are becoming increasingly significant to terrorists and terrorist organisations. Furthermore, scientific findings suggest that such attacks are becoming more prevalent. It is evident that the perpetrators of these attacks are not exclusively affiliated with organised groups; on occasion, individuals also perpetrate such acts. In certain instances, these events constitute direct attacks against sewage treatment facilities, while in others, the impact is indirect, affecting the broader sewage system. The most notable cases are presented in the results section. The authors' conclusions indicate that the significance of wastewater treatment plants and equipment has increased in recent decades in the context of terrorist activities. This assertion is substantiated by the databases and scientific literature analysed.

Keywords:
North Africa; environmental terrorism; wastewater; pollution; threats.

[1] DOI: 10.12700/jceeas.2025.5.4.408

[2] PhD student, Doctoral School on Safety and Security Sciences, Óbuda University, ORCID: 0000-0003-3658-4813, szucs.gabor@uni-obuda.hu.
[3] Assistant Professor, African Research Institute, Óbuda University, Budapest; ORCID: 0000-0002-6226-2626; zsolt.sza86@gmail.com.

Introduction

The accelerated progression of human civilization has been at the expense of the planet's ecosystem. The demand for raw materials is perpetually rising, while the accessible natural resources are limited in quantity. This has resulted in unparalleled climate variability. Consequently, humans are compelled to compete for access to resources, and the repercussions of climate change give rise to internal conflicts (Work, 2019) that, at a certain juncture, have the potential to intensify into violence or terrorism (Strozier & Berkell, 2014). International laws and agreements explicitly prohibit the intentional and indiscriminate destruction of the environment, resources, and vital civilian infrastructure, especially when the damage is grossly disproportionate to military necessity. (Gleick, 2006) The term "environmental terrorism" is used to describe acts that deliberately and indiscriminately target these infrastructures. This term is particularly salient in the context of climate change, demographic trends, and environmental degradation, which are increasingly placing pressure on the availability of basic resources such as food, water, and energy. These resources, in turn, have become primary targets for those seeking to cause harm (Remmits & Torossian, 2021).

The Middle East and North Africa (MENA) regions are particularly vulnerable to the rise of environmental terrorism. The MENA region, an expansive geographical area extending from Morocco in northwest Africa to Iran in southwest Asia, encompasses a diverse array of countries, including those in the Middle East and North Africa. The World Bank's adoption of this nomenclature is rooted in the recognition of salient cultural, religious, linguistic, and historical affinities and cohesions among the populace, which are concomitant with the lifestyle and consumption patterns exhibited by the region's majority. The MENA region exhibits significant political and economic diversity. It encompasses oil-rich Gulf economies and resource-poor countries compared to their population, such as Yemen, Egypt, and Morocco. The population of the MENA region constitutes approximately six percent of the global population, a figure that is nearly equivalent to that of the European Union. (Moustakbal, 2025). However, the present study will concentrate on the North African part of the MENA region. The Middle East region will be the subject of future research.

The Northen-African region is characterized by its aridity, ranking among the most water-stressed regions globally. It exhibits extreme rainfall variability worldwide, with approximately 60% of its water originating from transboundary sources, including surface water and aquifers. According to the Food and Agricultural Organization of the United Nations (FAO), the region experiences greater water stress, defined as water withdrawals as a percentage of total renewable surface freshwater availability, compared to other regions globally. Data from 2023 indicates that the average per capita renewable availability of water resources is 10 times less than the worldwide average. (Lahham, Mateo-Sagasta, Orabi, & Brouziyne, 2022)

The capacity of terrorist groups operating within the North-African region to adopt and implement water-related resources as instruments of conflict is contingent on the availability and quality of environmental resources, as well as the sensitivity and

potential of these resources to be employed as instruments of conflict. The region is particularly susceptible and conducive to the adoption of these tactics due to several factors. Firstly, the arid climates of the region render water resources scarce and of substandard quality, thus heightening the vulnerability of the region to water-related conflict. Secondly, a considerable proportion of the population relies on the region's major water sources for domestic water supply, whilst these same sources are also critical for energy production, agriculture, and livestock farming. Thirdly, state instability, weak institutions and corruption restrict the ability of governments to deliver basic services, manage critical environmental resources, enforce rights, resolve competition over resources, and limit illegal connections to power lines and the construction of illegal wells. (Remmits & Torossian, 2021) In the North-African region, terrorist groups have swiftly discerned the strategic value of key water resources and associated infrastructure as a means to advance their military and ideological objectives. An interesting dynamic can be observed in the Lake Chad region of Africa, where the population is heavily dependent on the water of the lake as a primary source of water. The region is characterized by instability in water and food supplies, which Boko Haram has exploited to the extent that the group has been able to provide basic goods in exchange for the support and services of the population and to recruit additional members from the local population, therefore the group can extend its authority over the region (Piesse, 2019).

The reuse of water has been identified as a potential solution to the challenges posed by the increasing pressure on water resources, which are already under strain. Most national water strategies and plans in the region depend on wastewater treatment as a fundamental component of the national water resources mix, with the objective of reducing water deficits, preserving the natural environment and facilitating socioeconomic development. In Morocco, for instance, the rate of wastewater treatment has increased from 7% in 2006 to over 50% in 2020, a development attributable to the implementation of the National Liquid Sanitation Plan in 2006 and the new National Shared Liquid Sanitation Plan (PNAM) in 2019. In Egypt, the Minister of Housing, Utilities and Urban Communities has announced the construction of 151 sewage treatment plants across the republic, with a capacity of 5 million m3 of water per day. (Lahham, Mateo-Sagasta, Orabi, & Brouziyne, 2022)

North African governments have considered the strategic importance of improving wastewater treatment and taken concrete steps to achieve their goals. Given a significant proportion of the water produced is intended for reuse, it is important to ask whether these systems could also become targets for terrorism, as with drinking water, electrical networks and gas pipelines. The answer is yes. We conducted research into whether wastewater treatment systems could be targets for terrorism. Based on our findings, we concluded that they could be targets and have been targets in the past. We have summarized our research in a recently published article (Szűcs, Barten, & Besenyő, 2025), which also serves as a starting point for our current research.

Methods - Database Selection

The research is of a secondary nature, consisting of database analysis and a review of related studies, publications and reports. In the quantitative part of the study, the research focuses on the analysis of attacks on wastewater treatment systems and facilities in the North-African region, with a focus on the situation in Algeria, Egypt.

In selecting the databases on which to base the subsequent presentation of documented instances of physical attacks, the authors accorded equal importance to key criteria, including global coverage, public accessibility and reliability from the perspective of the wider scientific community. In order to meet the aforementioned requirements, the research was based on a review of the Global Terrorism Database (GDT) (Global Terrorism Database, 2021), which was compiled by the National Consortium on Terrorism and Responses to Terrorism (START) at the University of Maryland. This database encompasses over 200,000 documented terrorist incidents from 1970 to 2020. A comprehensive keyword search was conducted on the data set, with the following search terms: "North-Africa", "wastewater", "sewage", "plant", "attack", "explode", "bomb(ing)", "assault".

Publication Selection

As stated in the preliminary section, the North-African region is particularly vulnerable to environmental and eco-terrorism. Water is an important resource, not only for drinking water but also for agriculture, energy production, etc., so owning or controlling the amount of water is a key issue. For MENA governments, efficient water management is a priority, and a growing population means that alternative resources, such as water from wastewater treatment for agricultural irrigation, must be harnessed. The North-African region has seen notable advancements in wastewater treatment, driven by the mounting recognition that water reclamation through treatment can alleviate water scarcity issues. It is indisputable that intensifying wastewater treatment, constructing plants and sewerage systems, is imperative to maintain water scarcity levels, which are deteriorating. However, it is equally important to recognize that these systems could be prime targets for terrorist activities in the region, like attacks on electricity grids or oil pipelines.

To obtain a comprehensive overview of water and sanitation incidents in the North-African region, the authors reviewed existing literature in English and Arabic. To identify relevant websites, news portals and studies, a keyword search was conducted using the keywords "Northen-Africa", "wastewater", "incident", "threat", "attack" and "terrorism"."

Discussion

First, it must be stated that putting together thorough research on the latest terrorist attacks against wastewater facilities was not an easy task due to several reasons. On the one hand, despite the multilingual search (keywords looked up in English, Arabic and French) there were few relevant hits on the terms “wastewater”, “terrorist attack”,

"North Africa" and "bombing", even though they were used in relation to each other. On the other hand, the sources that one went through to understand the phenomenon and be able to describe it in detail are not so fully developed yet, and thus it takes considerable time to assess the facts on the ground.

After concluding the research, we saw that how attacks against wastewater plants a socially marginalized bulk of events were. We understood, that although these themes would present something extremely new, not well-researched and that thorough, serious study and work had to be done to achieve positive results and to put irrelevant questions aside, reading takes time and practice is difficult to understand and use in this area of studies. We dug ourselves deep into the research material and the databases on terror incidents, and subsequently realized, that the 6-7 events that had happened in relation with attacks on wastewater management in Africa were not enough in themselves to draw tendencies, charters about them. During our research, we used promising technical opportunities to try this out. There were 2 important databases on terrorism: First, the ACLED database, which put down terrorist attacks sincerely, just as they have happened. The other database was RAND DATABASE. The second compilation also provided us with detailed description on events. However, the phenomenon was so real, that something of a go-between solution has been found. The articles and studies on the theme were also useful and provided us with a great opportunity to expand our research concerning the wastewater-related terrorist events, which we tried as much as we could. Altogether, we got to know that the material and analysed events were interesting in nature and could lead us to a considerable result.

My colleague in the first part went analysing the pn of "eco-terrorism" and its consequences to our life, this way he opened the discussion for us to study the topic. My job is now to base my research on requesting help from the previous findings of my colleague and the important notes he laid down. I can only but promise, that the article will take into consideration his results as well. Perhaps, after thorough research and a joint work the Discussion chapter of the case will be promptly outlined, and its results will be revealed as well.

Analysed Facts and Countries - Research Methods and Results

Besides understanding the relevance of the scientific material, that can be found on wastewater-management when concluding research, it is also important to state the real scientific facts that the researcher is able to receive from studying the subject at hand. To make our article complete and be able to present new, relevant scientific findings on the theme of wastewater-related terrorist incidents, it was inevitable to look through the databases and the literature at hand. I did so by using the Internet, scientific forums and other important sources. During my research, for finding relevant scientific material on the issue the RAND database on Worldwide Terrorist Incidents and the Global Terrorism Database was used. I ran through the Internet and these databases, and several important homepages the terms "wastewater", "terrorist attack", "North Africa" and "bombing" in English, Arabic and French, to achieve the maximum results possible

during the study, it has to be stated that the available data on wastewater-related or WWTP- related terrorism as a definite term is rare to find, even though a real thorough search was concluded on the theme and its keywords. Terrorist incidents are frequent in the past 10-20 years – as the databases show to us – but special areas in it like wastewater-concerned terrorist attacks are difficult to find. However, our goal was to conclude research on this specific area of expertise, thus we tried to do are maximum to achieve appropriate results. Looking through the relevant part of the Internet, literature and databases found on the theme it can be assessed that these terrorist attacks are more likely to happen in the Middle-East, but we decided that in this article we would concentrate during our research on North Africa, since after the rise of the ISIS in the 2010s, several terrorist organizations (even Al-Qaida) have moved to this part of the world, and instead of Afghanistan and Pakistan, there main territory is starting to be the MENA region (Middle East and North Africa). Thus, we decided that our research should be based on the facts that we find in North Africa, since the affiliates of global terrorist organizations are leaving their footprints in the region.

Beginning with the evaluation of the found incidents and sources, we may first start with Egypt, in which there is definite track of terrorist attacks against WWTPs and wastewater installations. The idea to conclude an article on the wastewater-related terrorist incidents came from a terrorist attack in Egypt: on 19 October 2014, several bombs exploded in Al-Sharqia, during which the nearby WWTP and the sewage system was destroyed. 2 bombs detonated, but 2 more didn't go off. Nevertheless, it was a vicious attempt to damage the drainage system of the town. Fortunately, according to the sources, there were no casualties, but the economic and social damage it caused is beyond belief. During my research, I found several sites concerning the attack (arabic.cnn.com (CNN Arabic), spa.gov.sa (Saudi Press Agency) & ahram.org.eg (El-Ahram).[4] The attack can also be found in the Global Terrorism Database (No. 201410290057/139828). The terrorist attack can be considered the first actual aggression against a WWTP in North Africa. Although there were no casualties, this attack was a clear sign from the terrorist organizations, that the sewage systems and infrastructure of a country can be a target as well. The orchestration of this incident shows that the awareness that the terrorists give to this issue at hand. It was not simply a reckless aggression: the attack was carried out in detail, and it was well-planned. Thus, we must conclude that the action besides the damage it caused was a well-orchestrated attack on a strong power in North Africa. Therefore, the wastewater installations in Africa might be in danger, if we don't take seriously these groups and incidents.

The next incident I took into consideration was the incident in Libya, in Al-Khums. The sewage system of the town was damaged seriously by un unknown assailant, which is counted as a terrorist attack. As mentioned before, the literature takes into consideration the areas that are mainly concerned by these kinds of terrorist actions, and Libya was one of the countries mentioned. The incident is assessed on some Internet

[4] See: https://arabic.cnn.com/middleeast/2015/01/26/egypt-clashes-explosion, https://www.spa.gov.sa/1321078 and https://gate.ahram.org.eg/News/589847.aspx

pages (alwasat.ly (Al-Wasat) & alsabaah.ly (al-Sabah)),[5] which are both of Libyan origin. The attack was committed on 7 September 2023. Nevertheless, the relevance and the timeliness of the problem can be seen valid. It laid down the foundations of serious attacks against WWTPs. Not as organized, as in Egypt, but it was still an attack on the sewage system of a large town in Libya, which is also a great power in North Africa. The aggression shown by these examples presents that there is frustration in terrorist organizations, who try to look after more and more opportunities to cause damage in the civilian infrastructure. This can be seen in the Libyan attack as well: both organized and single terrorist attacks are becoming more and more frequent on water- and wastewater-related installations.

The next situation is odd, but it is also related to terrorist activity. On 12 November 2001, there was a great flood in the Algiers (Algeria), because to stop the infiltrating terrorists, the Algerian government had to close the sewage system and the drainpipes in the region, thus at least 575 people died in this incident. Although these incidents are not always close to each other in time, the relevance of the importance of sewage systems for a country's security is obvious. The Algerian terrorist incident was published by albayan.ae (Al-Bayan), an Emirates-based online newspaper.[6] The incident took place in 2001, when the Algerian jihadist organizations were on the rise, but it still shows the tendency, that radical fundamentalists take the opportunity, whenever it is possible to hit at the government, even doing it indirectly, as is the situation here. This example of terrorist aggression also shows that during the recent times terrorist actions concerning wastewater facilities rose considerably.

Staying in Algeria and looking through the databases I stumbled upon another terrorist-related attack on a wastewater institution. According to the RAND database (No. 38697), on 20 August 2008, AQIM (Al-Qaida in the Islamic Maghreb) a suicide bomber drove a car into some workers, who were standing by. These people were working in the nearby Water Purification Plant. We can conclude that this is practically a WWTP, thus a wastewater facility. it is interesting to note that hence the terrorists not only directly attack the WWTPs, but also indirectly, targeting workers there. The aggressive nature can be shown here as well, and the attack fits into the pattern we are trying to build up in this article that the terrorist are interested in wastewater installations or WWTPs, and they are willing to use every method at their hands to cause damage.

Remaining in Algeria there still was a water-related incident, which indirectly can lead to the attacks on wastewater facilities. On 20 February 1998, In the town of Sidi Khaled, the local water tower became the target of the terrorists, who took advantage of the careless security forces, and attacked the installation. The incident is also recorded by the Rand database (No. 8252). Although this was not a clear attack on a water

[5] See: https://alwasat.ly/news/libya/411253?author=1 and https://alsabaah.ly/%D8%AB%D9%84%D9%88%D8%AA-%D8%A7%D9%84%D9%85%D9%86%D8%B7%D9%82%D8%A9/

[6] https://www.albayan.ae/one-world/2001-11-13-1.1212866

installation, water towers can be counted as WWTPs connected to the sewage system, thus indirectly it could have caused serious damage on the wastewater installations.

As said, we concluded thorough research on the terrorist-related wastewater attacks. However, this is what makes this research so challenging. This is the way I found another terrorist attack that happened in Nigeria. This incident was a relevant example of the terrorists' hunger for destruction: according to RAND database (No. 36735) a water disposal pipeline was attacked by radical groups in Nigeria, in the Niger Delta. A bomb was used during the assailment, which caused serious problems for the Nigerian oil companies concerned in the matter. The incident happened on 6 January 2008, and – although it wasn't confirmed – it might have been the notorious terrorist organization MEND (Movement for the Emancipation of the Niger Delta). This shows that the North-African (Sub-Saharan) terrorist organizations are interested in the attacking of the WWTPs for achieving their goals.

Conclusion

Summarizing the scientific facts and the literature that has been assessed, one can get to the result that although the sources that can be analysed and the resources that can be used to the researcher's advantage in the scientific work are porous, nevertheless, even if the situation is so, putting together these pieces of events concerning the terrorist activity against WWTPS, one can get results, even if further study is advised.

The results and scientific facts of the research show a clear tendency, from the 2000s Algerian radical Islamism through the 2000s Al-Qaida-committed actions even until the modern ISIS/Al-Qaida era, that radical terrorism in North Africa is rising, and it has also taken some interest in the attacking of WWTPs. Although wastewater installations are not the primary target of terrorist organizations, it can be concluded according to the databases and the research done on the attacks that the importance of wastewater (and water) plants and installations for terrorists and terrorist organizations is on the rise, and an increasing frequency can be shown from the scientific findings. The attacks are not only committed by a group, but also sometimes individuals carry out the attack. Sometimes the incident is a direct aggression on a WWTP, sometimes it involves only indirectly the wastewater system.

Altogether it can be said that the relevance of wastewater plants and WWTP installations has grown concerning terrorist activities in the last decades, and this can be clearly shown in the databases and scientific literature used. Finally, it can be assumed, that according to the relevant data that can be found in English, Arabic and French on these incidents, their frequency shows an increasing rate, and with the increasing level of terrorism in general, the committed terrorist acts against WWTPs and wastewater installations have been on the rise in the recent years.

Notes on Contributors

Gábor Szűcs is a doctoral student at the Doctoral School of Security and Safety Sciences of Óbuda University. His research interests include the safety and security protection of

wastewater systems as critical infrastructure. For more than ten years he has been working as a project manager in wastewater infrastructure development projects funded by the European Union. During his work, he has participated in several field visits and his observations there have inspired him to focus his PhD research on the safety engineering of wastewater treatment plants and systems. After successfully completing his doctoral studies, he plans to continue researching this topic and publishing his findings.

Zsolt Szabó finished his PhD at the Eszterházy Károly Catholic University. He is a researcher at the Africa Research Institute at Óbuda University, Doctoral School for Safety and Security Sciences. He graduated at Péter Pázmány Catholic University in Arabic-History major. In the last years, he has actively published articles and reviews in several journals and aims to continue his scientific work in the future. He speaks Arabic, English and Italian language, and he has learned French for one and a half year as well. He intends to become a security expert and to get acquainted with African politics as well as cultural and social issues on the continent. He would like to continue researching African security politics and security politics in the frame of the institution and in every possible way.

Conflict of Interest

The authors hereby declare that no competing financial interest exists for this manuscript.
The author is a member of the Editorial Board. The manuscript was handled independently to avoid any conflict of interest.

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